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ABSTRACT

As part of a larger endeavor to evaluate the impact of communication technology on organizations, this study assesses the accuracy of information diffusion via electronic-mail and courier-mail systems in two large organizations which have implemented electronic-mail systems in the last three years. Data were obtained through the use of questionnaires prepared using the Episodic Communication Channels in Organizations (ECCO) method. Related literature is reviewed, the research methodology is discussed, and results are presented. Conclusions indicate that channel selection has little, if any, impact on the accuracy of message recall, and that the salience of a message appears to have a more significant effect on message fidelity. Future researchers will need to address the several intervening variables that may have affected the study results. References are provided, and an ECCO format is appended. (KM)

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Electronic and Courier Methods of Information Dissemination:

A Test of Accuracy

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*This paper is the result of a collaborative effort among these individuals. Dr. Sue DeWine served as the project director. The paper is also part of a larger investigation on the effects of communication technology in organizations.

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Introduction

Communication scholars are standing at the edge of a growing research domain. Within this domain old questions must be addressed in regards to new communication technology. The already uncertain nature of human communication may need to be expanded to include computer-mediated communication (Rice, 1984). The interactive capabilities of modern communication technology requires scholars to consider more complex questions than previous technology (e.g, television, radio, and telephone) may have demanded (Rice, 1984). However, the study of communication has also advanced since the early days of radio; the communication scholar is better prepared to examine the advent of complex communication technology.

Organizations have been receptive to implementing communication technology. For management, the utility for the equipment is related directly to improving productivity (Boczany, 1982). One of the most popular technological interventions in organizations appears to be the electronic-mail system. Kolodziej (1982) reported that a 1984 survey conducted by a New Jersey management group found that 83% of the largest U.S. business communicators will require extensive electronic-mail capabilities by 1987. The study of the new medium, however, is disproportionate to its growth.

The effects of electronic mail exceed productivity concerns. The electronic-mail systems permit immediate transmission of complex information and, more importantly, interaction among members of the system. These characteristics depart from the slow interoffice memoranda procedures that are losing a foothold in organizations. As the courier-mail systems begin to be replaced by electronic mail, the organizational researcher must ask what other variables are being altered by this new medium.

Electronic-mail systems are more complex than telephones. The latter invention allows for person-to-person interaction. In contrast, the electronic-mail systems allow person-to-machine interaction. The individual using a electronic-mail system may send a text to an

individual or query certain organizational data-base files; in both cases, the user is not talking directly with another person (Rice, 1984). Furthermore, in this new office, each person is electronically linked to every other person as well as to electronic data bases. These electronic links presumably alter the communication networks within the organization and, subsequently, the network roles of the individual who is part of that organization (Rice & Case, 1983).

A first step in examining electronic-mail systems would be to evaluate their effectiveness as an alternative channel for disseminating information within organizations. Management has endorsed the efficiency of the systems through their purchase. Nevertheless, the question remains, are electronic-mail systems more accurate than the traditional methods of information dissemination?

Electronic-mail systems represent a significant change in information diffusion from the courier-mail systems. Courier-mail systems have remained intact with xerography feeding their existence. Large organizations have maintained these in-house mail systems for distributing information throughout the company in much the same fashion and efficiency as the U.S. postal service. Yet, of necessity, electronic mail is replacing or at least displacing the courier system because the latter is comparatively slow and inefficient. The focus of this study is to assess the accuracy of information diffusion through both channels.

The study involves two large mid-western organizations which had implemented electronic-mail systems in the last three years. The study is part of a larger research endeavor to assess the impact of communication technology on organizations.

Review of Literature

The study is an extension of early organizational communication research that measured the effectiveness of different media. Findings from a variety of organizational studies need to be reexamined in light of new communication technology. The need for examination of communication

and information technology was recognized in 1967 by Sanborn.

Sanborn (1967) argued, "To become upwardly mobile in management structure, the manager in the future may well need to become not only a specialist in the content areas of his organization but also in the techniques of information technology" (p. 9). Sanborn went on to say that communication scholars need to prepare students for understanding new information systems. Sanborn believed, "With respect to the pressures to develop better understanding of information and communication systems, let me suggest that profit-orientation in business and cost-consciousness in all organizations are motivating forces in the improvement of communication systems" (p. 16).

In his short treatise, Sanborn provides one of the earliest arguments for examining new information and communication technology. The emphasis in this paper is to compare the effectiveness of two media--electronic mail and courier mail. ECCO surveys (Davis, 1953) were administered to employees to measure the effectivess between the two channels. The following literature review briefly examines channel effectiveness, ECCO, and electronic mail.

Channel Effectiveness

The effectiveness of different channels has been measured in many studies. Two classical studies included Dahle (1954) and Level (1972) who provide a point of departure for studies on the efficiency of one channel over another. Dahle (1954) examined the effectiveness of five methods for sending messages from management to employees. The methods included oral and written, oral only, written only, bulletin board only, and grapevine only. Dahle's study focused on downward transmission of information. Based on his results, he concluded that using oral and written messages combined was generally more effective than relying on a single method for transmitting a message. Dahle used a ten-item objective test to compare knowledge differences among channels.

One criticism of Dahle's study is the comparisons between seemingly dissimilar channels

such as oral or written versus grapevine or bulletin board. Further, Redding (1972) asserted that the test may have been too short and the information too detailed. He suggested that Dahle's findings should be studied with caution. Nevertheless, Melcher and Beller (1967) supported Dahle's claim that combinations of channels tend to be more effective than any channel alone.

Level (1972) studied the effectiveness of four channels of delivering a message from supervisors to employees. These methods included written only, oral only, written followed by oral, and oral followed by written. Level asked supervisors to rate the effectiveness of the methods among ten situations. In six of the ten situations, the oral-followed-by-written method was considered more effective. In 1972 electronic mail was barely in its infancy and did not represent a significant organizational medium.

One would assume that electronic mail would be more accurate than courier mail for at least two reasons. First, electronic mail is faster than courier mail. Typically, an in-house mail system may deliver a memorandum in two to five days, whereas a document may be sent electronically within nanoseconds. Related to this idea is the second reason that electronic mail may be more effective; it reduces the possibility of a serial transmission effect.

Redding (1972) believed that a serial transmission effect occurs when information is required to flow from one person to another. This person-to-person relay of the message is believed to distort the message in a variety of ways. Distortion occurs when the message is reproduced. Redding referred to this concept as message fidelity or the degree to which the reproduction of the message is similar to the original production; as in sound, the reproduction is never exact. Pace (1983) believed six kinds of distortions occur in reproduction including: omissions, losses, changes, additions, elaborations, and clarifications.

It seems probable that courier-mail messages will suffer more distortions because they take longer to reach the intended audience and are more likely to be effected by a serial transmission effect. Because the courier-handled message requires longer to reach the desired

individual, the individual has more of a chance to receive the message from peers and supervisors who may cause distortions. In contrast, the electronic-mail message is received instantaneously reducing the possibility of a serial message effect. Redding (1972) refers to instantaneous delivery as simultaneous message dissemination.

Simultaneous message dissemination refers to the sending of a message to a large number of people all at the same time. In the past, simultaneous dissemination would involve delivering a message to a large gathering of employees. Presently, electronic mail permits a message to be sent to all targeted employees simultaneously using one command key on the sender's terminal. Admittedly, the reality is more complex since employees may log onto their terminals at different times.

Since employees are capable of receiving the original message in a more timely fashion, electronic-mail messages would presumably suffer less distortions than the slower courier-mail message. The electronic-mail system relies more on a simultaneous message dissemination pattern. The courier message, on the other hand, may take approximately two-days before it reaches its location.

Several confounding variables exist that may reduce the efficiency of electronic mail. For example, the employee's ability to use or to have access to a computer terminal presents two constraints. An electronic-mail system requires organizational-wide implementation to be effective (Kolodziej, 1982). Yet, the cost of computer terminals and employee training may be prohibitive. Hence, a common scenario may be that the message is relayed to all people who have electronic-mail access (i.e., managers); managers are then obliged to pass the information on to employees. In this situation, electronic mail works in much the same way that a courier system works. These limitations suggest several criteria that affect channel selection.

Level and Galle (1980) summarized six criteria that management may use in selecting a channel. The criteria include availability, ability, cost, impact, relevance, and response.

Availability refers to the fact that the medium is accessible and ready for use in the organization. The organizations surveyed in this research project had been using the system for three years. Ability refers to the user's skill at operating the medium; in the case of electronic-mail software, this question is difficult to remedy. Cost is usually weighed between time and importance--significant messages will be sent through the quickest paths. Impact is concerned with the impression that the medium will have on the receiver. Relevance is a balance between impact and efficiency. For instance, one is more likely to send a written message for complex information than call someone on the telephone and explain it to them. Lastly, the sender may consider response time. Face-to-face interactions tend to provide the fastest response.

Determining message distortion involves two steps. First, the researcher must have messages from which to measure the degree of distortion. Second, subjects must be tested to determine how accurate they are at recalling the messages. To test message accuracy, Davis' (1953) ECCO analysis was used. The next section reviews briefly the procedure.

ECCO Analysis

ECCO (episodic communication channels in organizations) analyis is a method for examining organizational networks by tracing the message as it moves through the organization. ECCO may be used to provide a measure of accuracy for both the electronic-mail message and for the courier-mail message. ECCO may be used for measuring information distortion (Farace, Monge, and Russell, 1977) and making network approximations (Stewart, 1984; Stewart and DeWine, 1985).

ECCO is a straightforward method for tracking information dissemination. First, a message is introduced into the system and allowed enough time to reach the intended audiences. Second, a brief questionnaire is administered to organizational members. The questionnaire asks whether the employee knows all about the message, knew something about the message, or knew nothing about it. If they knew all or something about the message, the respondents are asked a number of

knowledge questions. Items may also address organizational rank, message salience, and message sources. Third, if using the data for constructing a network diagram, the respondent and source is somehow identified in order that his or her response may be linked to others in the organization.

Farace, Monge, and Russell (1977) suggested that network methods may measure a number of variables including structure, load, rate, redundancy, function, distortion, and efficiency. This study examined efficiency. "Efficiency is the measure of resources expended to communicate information to targets in the organization" (Stewart, 1984, p. 11). Previous literature has suggested that some channels are more efficient than others for permitting a message to reach its intended audience with a minimum of distortions. Distortion refers to the degree of leveling and sharpening that occurs to a message as it travels through the system.

Primarily ECCO has been used for tracing messages through an organization in order to determine the communication patterns in the organization (Bailey, 1974; Davis, 1953, 1968; Davis and O'Conner, 1977; Farace and Russell, 1972; Holsenbeck, 1976; Kaufman, 1978; Knippen, 1971; Lee, 1971; Marting, 1969; Rudolf, 1972; Sanborn, 1968; Schorr, 1972; Steele, 1972; Stewart, 1984; Sutton, 1970; Sutton and Porter, 1968; Timpano, 1972; Wright, 1979). Of the preceding nineteen studies, the average number of messages used for the ECCO analyses was 8 ($\mu = 7.65$); the number of messages ranged from one to fifteen. Selection criteria for the message varied from no criteria reported to rigid criteria. Stewart (1984) suggested that, in order to adequately assess communication patterns in organizations, researchers need to select and test more messages. In only one study the researchers report using fabricated messages for the analysis (Rollins and Charters, 1965).

The reason for testing or comparing communication patterns varies. Only Brown (1978) used the method to assess the effectiveness of communication of formal messages through regular channels at a small community college. Brown traced only three messages and received a response rate of 50% on the first, 45% on the second, and 40% on the third based on a 100 member

organization. However, Brown's low response rate limited the generalizability of his results.

Concerning the validity of the method, Davis asserts that ECCO appears to be reliable and valid "based upon judgment, audit, and built-in checks and balances, rather than statistical proof" (as cited in Stewart 1984, p. 30). Admittedly, there are variations among researchers. For instance, Davis (1959) provides a sample of the original message with the questionnaire. In contrast, Sanborn (1968) attempted to reduce interference between the person's response and the actual message, so he included only a short discription of the message placed at the top of the questionnaire.

Lee (1971) raised a question about the reliabity of time data when using ECCO. He believed that ECCO appears to be valid overall, but that items asking the respondents how long ago they received the information appeared unreliable. Stewart (1984) questioned the validity of determining communication patterns on a limited number of messages. Further, Davis (1968) contended that ECCO is just as effective for testing formal communication channels as it is for testing informal ones (i.e., grapevine).

The preponderance of literature on ECCO centers on determining the network; apparently few studies exist that use ECCO to compare competing communication channels. Overall, ECCO appears to be one method for adequately assessng efficiency of information through a variety of both informal and formal channels. Comparing messages using ECCO appears to be unique. Moreover, examining message fidelity of a new media creates obstacles. Below recent studies addressing the impact of and attitudes toward electronic mail are discussed.

Communication Technology and Electronic Mail

Electronic mail is only one type of new communication technology. Among other types of "new media" that are impacting organizations, Rice and Bair (1984) included personal computers, teleconferencing, office information systems, and computer conferencing, to name a few. In spite of the increasing influence of new communication technology, relatively few studies

have been completed that measure its impact. Rice (1984) believed that electronic mail could impact, among other things, the medium or channel one selects and the timing of communication.

The capabilities of electronic-mail systems may not be widely understood by communication researchers. Until recently, the investigation of new technology appeared outside the domain of communication inquiries. An understanding of the technical aspects of electronic mail may help one's understanding of the technology's potential impact. Electronic-mail systems or computer-based message systems permit the user to send, receive, or forward messages using "simple but powerful software" (Davis and Olson, 1984). Electronic-mail systems include public electronic bulletin boards and public electronic-mail systems as well as the in-house message systems that are the focus of this study.

The electronic-mail system allows employees who have access to an on-line terminal (one that is linked to the system's mainframe computer) to send, receive, and forward messages electronically through a software program. The software used in these two companies is referred to as PROFS (professional office system). PROFS permits the user to send messages to a specific individual, one's work group, or the entire organization. The sender may also request through the program that the computer notify the sender that the intended person received the message. When an individual logs onto his or her terminal, the person is alerted that a message is waiting. Electronic mail allows detailed written messages to be sent simultaneously to every user in the organization. The need for the secretary to retype and copy messages is eliminated.

Of the studies examining electronic mail, Steinfield's (1985) study is most appealing. Steinfield (1985) examined the task and socio-emotional uses of electronic mail; he was interested in who was using the electronic-mail system and for what purpose it was being used. Steinfield surveyed 400 employees in a 2,000-member organization and had a 55% response rate. The organization's electronic-mail system had been in place for seven years. Steinfield's survey measured employee attitudes toward the electronic medium.

In contrast to his prediction, he found that level, age, tenure, and education were not related to task-oriented use of electronic mail. He further argued against the popular assumption that use of computer-media communication is unidimensional. Steinfield believed social presence of the media is individually determined and positively related to use. His results suggested that attitude toward technology, one's organizational role, and organizational context may influence one's use of electronic mail.

Steinfield reached several additional conclusions that could have a direct relationship on the findings of the present study. If the organizational member is having to share the terminal with other people, the potential user is likely to find another medium if he or she believes the system may be busy. Additionally, if the system does not have a sufficient number of people linked to it, then the user is less likely to send messages electronically. Steinfield found that the need for communicating across locations tended to be the primary reason people used electronic mail. Hence, in larger or more decentralized organizations in which workers are physically separated and where a need to communicate is high, task-related communication is more likely to occur. Lastly, individuals are more likely to use electronic mail for task-related purposes if the system is easy to use and if the system is perceived as useful.

Picot, Klingenberg, and Kränzle (1982) examined the impact of new office technology in 30 West German and West Berlin locations including 640 users; the sample group included 241 subjects. The users included 40% technical and scientific positions and 60% administrative positions; the users were mostly lower-level managers (50%) with middle-level managers (40%) and higher-level managers (10%) rounding out the group. The researchers measured attitudes toward different media. Based on a factor analysis of the instrument, the researchers identified four factors related to attitudes toward telephone, face-to-face, mail, telex, and fax. The factors included stimulation, comfort, dependability, formality, and privacy.

Of these five channels, telex is most similar to electronic messaging. According to the

authors, telex "integrates features of electronic information and word-processing devices with an advanced and comfortable electronic telex machine" (p. 679). The telex system includes an electronic storage of messages and accessibility to the worldwide telex system. For this reason, Picot, Klingenberg, and Kränzle's (1982) results concerning the telex are relevant to this discussion.

Picot, Klingenberg, and Kränzle (1982) compared the media across each of the five factors. Telephone ranked highest on comfort while face-to-face channels ranked higher on stimulation and privacy. The mail channel ranked highest on formality and dependability, second on privacy, third on stimulation, and sixth on comfort. In contrast, telex ranked second on formality (its highest rank), fourth on comfort and dependability, and fifth on stimulation and privacy. However, respondents also appeared to want less "classic mail communication" and more use of the "fast new electronic text media" (p. 687).

These rankings suggested that organizational members may be less likely to use an electronic channel if they question its privacy or find it less than stimulating. These results suggested caution in judging the effectiveness of new media when compared to established channels, such as telephone and face-to- face exchanges. To this end, Picot, Klingenberg, and Kränzle concluded that "there will be evolutionary rather than revolutionary impacts on people's way of life" (p. 691).

Research Question

The need to assess new organizational media is important for determining the evolutionary impact of the technology. In 1981, Wilo asserted, "Communication scholars could have been in the forefront of not only studies of communication technologies but also in planning its application. However, research has been both late and inadequate" (see Rice, 1984, p. 15). This study examines the efficiency of electronic mail when it is compared to its traditional couterpart, courier mail. Though one might expect that electronic mail is faster and, therefore, more

accurate, the literature is inconclusive. Therefore, the following research question is posed:

Will electronic-mail messages suffer less distortion than courier-mail messages?

Methods

The methods involved a dual process since two separate mid-western organizations were involved. Below the subjects and research setting are described. Then, the selection of messages is discussed and the statistical methods described. Following this discussion, the results of the study are presented.

Subjects and Research Setting

Two large mid-western companies were selected. One organization was predominately an underwriter and investor (hereafter, organization A), and the other organization was involved in the production of computer-related hardware (hereafter, organization B). Both organizations had implemented an organizational-wide electronic-message system called PROFS over the last three years. Both organizations provided training for employees on how to use the system.

PROFS is a sophisticated message system that includes electronic messaging, simple word processing, scheduling (for yourself or with someone else), information sources, and telephone directories. PROFS requires a substantial mainframe computer to maintain stored records. Managers in both organizations believed that their organization was large enough to make the system cost-effective.

Subjects involved multiple levels of the organization including upper-level management, mid-level management, sales people, secretaries, engineers, planning and data processing personnel, and other administrative assistants. A cross-section of employees was necessary for measuring the depth that a message may have travelled. For instance, one would expect little distortion to occur between upper-level and mid-level management, but more distortion is possible to detect when comparing mid-level managers with lower-level employees. The actual

number of subjects varied among the messages, from 6 to 32 respondents.

Instrument

As discussed in the literature review, the ECCO format for writing the questionnaire was adopted. Four messages were selected for each organization. In each organization, four questionnaires related to each memorandum were attached. At the top of the questionnaire, a key phrase (usually the phrase from the "RE" section of a memo) was provided; following this, the respondents were asked if they "knew all about it [the message topic]," "something about it," or "nothing about it." If they anwered "all" or "something," they were asked to complete that page of the questionnaire. For each memo, five true-false items were written that tested facts that had been presented in the memorandum. Questions were also included regarding salience of the message using a Likert-type scale, time since receipt of the message, and sources where they had received the message. A sample copy of the ECCO format is included in the appendix.

Message Criteria. The criteria for the message were that it be a routine message issued within three to four days prior to the ECCO tracing. Because time measures on ECCO tend to be unreliable, the intention was that the memos would have had nearly equal amounts of time in the system. To be sure, electronic-mail messages may be received earlier, but it was hoped that the courier message was allowed enough time to reach its destination. Further, two of the messages were to be courier mail and two electronic mail. Lastly, managment was asked to select messages they believed were equally salient. Management was hesitant to permit us to examine the memorandums since some information was deemed proprietary. Accepting the limitations of this approach, the messages that management in the organizations provided became the message pool.

Additionally, organization B only indentified one courier message to three electronic messages; this complication was due mostly to the integration of the technology which had replaced the older system. It was interesting to note the completeness of the conversions to electronic mail which made it difficult to identify a recent courier-mail message. Nevertheless, two courier

messages and two electronic messages were used in organization A.

For both organizations the messages included retirements, promotions, organizational changes, training and development changes, and announcement of benefits. The item on salience of the issue to the respondent provides one measure for comparing memorandum. Additional items asked how long ago the individual had received the message and through which channels they received the message.

The ECCO questionnaires were administered to subjects along with questionnaires included in the larger study. Respondents were asked to complete the questionnaires and return them the next day or send them to a predetermined mail location that the organization's management had arranged for the researchers.

Statistical Analysis

The statistical analysis involved several steps. First, responses were coded to distinguish between courier or electronic messages and organization A's and B's messages. Second, an overall mean score for both electronic and courier groups was calculated based on responses to the true-false items for each message. The third step, then, involved comparing the means for both groups using a one-tailed T-test to determine the level of significance. The same procedure was done for salience and time. In order for a useful comparison to be made, the mean between the electronic message and the courier message would need to be significantly different while the salience between the same group remained insignificant.

Results

Mean statistics were gathered on the five test-items scores, message saliency, and days since message was received. In addition, a one-way ANOVA tested for differences among message mean scores and message salience; based on the results of the ANOVA, the Tukey-HSD procedure was used to explain any significant differences. Results of these tests are presented below.

Message Fidelity

The scores on the five-item true-false tests were considered a measure of message fidelity or message accuracy. Mean scores were derived from the average number of items an individual scored correctly. A correct response was scored as 1, an incorrect score as 0. A mean score from 0 to 5 was possible.

Respondents who checked "I knew nothing about it" were asked not to complete the rest of the survey and, consequently, their scores were not included in the mean. In addition, some respondents did not complete the questionnaire as directed (e.g., they provided checks instead or "T" or "F"), so their responses were also discarded. Table 1 shows the total population and the number of people whose responses were not scored. Included in the table is the mean score on the five-item tests.

Table 1: Number of Responses among Messages

Organization A

Message	Total N	Knew Nothing	Invalid	Sample N	Channel	Mean Score
#1	34	0	2	32	Courier	3.87
#2	34	14	2	18	Courier	3.44
#3	34	5	4	25	E-Mail	2.80
#4	34	0	9	25	E-Mail	4.92

Organization B

Message	Total N	Knew Nothing	Invalid	Sample N	Channel	Mean Score
#5	19	1	5	13	Courier	4.40
#6	19	3	10	6	E-Mail	3.92
#7	19	7	2	10	E-Mail	4.17
#8	19	1	10	8	E-Mail	3.00

A one-way ANOVA tested for significant differences between electronic mail and courier mail regarding mean scores on the five-item tests. The ANOVA was significant ($F = 11.69$; $df = 7$ and 129; and $p<.01$). Table 2 shows results; an asterisk indicates a significant difference between a courier-mail and electronic-mail message at $p < .05$. Message #4, an electronic-mail message in organization A, was significantly recalled more accurately than any other message.

Table 2: Significant Differences among Test Scores

Organization A Message Mean	Message #	1	2	3	4
3.87 (courier)	1				
3.44 (courier)	2				
2.80 (e-mail)	3	*			
4.90 (e-mail)	4	*	*	*	

Organization B Message Mean	Message #	5	6	7	8
3.92 (courier)	5				
4.17 (e-mail)	6				
4.40 (e-mail)	7				
3.00 (e-mail)	8			*	

*p<.05

Message Salience and Knowledge

To further evaluate the differences among means, scores for a Likert-type scale were used to measure salience. Table 3 includes the means scores for salience (five would be highly salient). An ANOVA on salience of messages was signifcant ($F=7.2$; $df=7$ and 129; $p<.01$) with message #4 being significantly different than all other messages (see Table 3).

Table 3: Significant Differences Among Message Salience

Salience Mean	Message #	1	2	3	4	5	6	7	8
3.94 (courier)	1								
3.67 (courier)	2								
3.44 (e-mail)	3								
4.72 (e-mail)	4	*	*	*		*	*	*	*
3.54 (courier)	5								
3.33 (e-mail)	6								
4.20 (e-mail)	7								
3.12 (e-mail)	8								

*p<.05

It seems reasonable that the higher salience for message #4 is accounting for the significantly higher mean; this proposition would dismiss the possibility that electronic-mail messages retain a higher accuracy score. Certainly, the assumption is supported by the high positive correlation between message accuracy and message salience. A Peason correlation between knowledge and salience resulted in $r=.56$, $p<.01$. Although message #4 had the only significant difference in

terms of salience, one other result is of interest. Courier-mail message #1 in organization A was recalled more accurately than the other electronic-mail messages.

Length of Time Since Receiving the Message

A Pearson product-moment correlation coefficient was completed to examine whether messages received at different times had any effect on accuracy of recall. To calculate when messages were received, respondents indicated how many days ago they had received the message. Responses were scored as follows: up to 3 days ago was scored 1, 4 days ago was scored 2, 5 days ago was scored 3, 6 days ago was scored 4, and 7 or more days ago was scored as 5. The average number of days since respondents had received the message was between 5 and 6 ($x = 3.81$, std. dev. = 1.14). The overall Pearson r showed no significant correlation between the mean on the test items and the mean for time since message was received ($r = .051$, $p < .28$).

Message Redundancy

The cross-tab procedures compared respondents' perceptions of where they had received the message. The last item on the questionnaire asked if the respondent had received the message from any of the following sources: written memo, electronic mail, immediate supervisor, telephone, talking with a peer, and overheard someone. In most cases, respondents reported that they received the message from multiple sources.

Of the people who actually received a written memo, 30 respondents reported they had received the written message; the other 30 respondents did not remember receiving the message via a written memo. By comparison, of the 76 people who responded to the electronic-mail questionnaires, 66 believed they had received the message through the electronic-mail systems. Farace, Monge, and Russell (1977) contented that messages may be received from additional sources. Supporting this assertion, respondents checked the additional categories as follows: 14 talked with a peer, 12 heard it from immediate supervisor, 4 overheard the message, and 2 received the message by phone. These findings suggest the difficulty of measuring channel

effectiveness when interference from other organizational channels is difficult to control.

Discussion

Many possible explanations may account for the results. One possibility is that novelty of channel effects message fidelity. Both organizations had been using the electronic-mail system for at least three years. Consequently, most messages were being distributed through the electronic-mail system. The novelty of the electronic-mail system may have diminished, whereas a message sent through the courier may appear unique in view of largely paperless memoranda. Because the channel was novel or nontypical, respondents may have been more likely to recall the message.

As reported above, a manager in organization B had difficulty identifying a courier-mail memo and found only one courier-mail message that had been sent within the required time frame. In contrast, numerous electronic messages were available for sampling. To this extent, a courier message may appear unique to an employee who is familiar with the new electronic "tradition" of logging on every morning to read his or her mail.

Second, the PROFS system is programmed to erase messages after a certain time period in order to save computer memory. Two problems may result. First, if a person does not pick up the messages within the time limits, the person may never receive it. Second, the system reduces the number of times that the person may view the message. Related to this idea, a respondent complained that it took too long to call up one's messages. In contrast, a courier-mail message has the advantage of being filed for future reference until the person wishes to discard the message.

A third explanation may be that too few messages were used. Only one courier-mail message and three electronic-mail messages were used in organization B. Therefore, the small number of messages traced in each organization may be creating a bias sample.

Finally, the most plausible explanation that may account for the higher mean scores for courier

messages is the procedure for message selection. The researchers requested that the messages be selected that company executives believed were equal in salience. However, significant differences for message salience did occur. The message that received a significantly higher mean than all other messages also received a significantly higher salience. Apparently the content of message #4 ("organizational changes") accounted for recall of message content more than the channel which was the electronic-mail system.

Conclusion

Based on this study, one would conclude that channel selection had little, if any, impact on the accuracy of message recall. This conclusion is particularly interesting when considering the product for one of the companies--i.e., computer hardware. Moreover, it appears that the salience of a message appears to have a more significant effect on message fidelity.

Admittedly, the limitations of the research design restrict the conclusions. First, a larger message sample for both media that was selected by the researchers may have improved the findings. Second, increasing the number of test items from five to ten per message may have altered the results. Third, if the differences are due to novelty of a message, a longitudenal study that assesses the progress of use of an electronic-mail system may have explained some of the discrepancy found in this study. Finally, the researchers were unable to control adequately for message salience or message redundancy--a design problem that is particularly elusive in field settings.

In spite of these limitations, the researchers did attempt to compare channel effectiveness based on knowledge of messages sent through a channel. In contrast, previous researchers relied on employees' perceptions of effectiveness of a channel. In light of this study, employee perception is probably not the most useful method of evaluating channel effectiveness. Recall-based and salience measures may be more accurate for assessing channel effectiveness.

In summary, future researchers will need to address several intervening variables when facing the difficult task of comparing the channel effectiveness. This study suggests that channel comparisons are confounded by message salience and message redundancy. Researchers should continue to examine new communication technology's effectiveness and impact on organizational variables instead of accepting at face value the benefits or costs of the technology.

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Appendix

Please respond all questions in terms of your own impressions and as honestly as possible. Your responses will remain confidential. Thank you, in advance, for your cooperation.

Prior to receiving this questionnaire, what did you know about the information in the box? [Note: A descriptive title was included in the box for each of the eight messages.]

1. Please Check One:

   A. I knew all about it. _____
   B. I knew something about it. _____
   C. I knew nothing about it. _____

2. If you answered "I knew nothing about it," you have completed the questionnaire.
   If you answered "I knew something about it" or "I knew all about it," please continue checking each statement below either true (T) or false (F) about the items below.

   A. _____
   B. _____
   C. _____ [Note: Five true/false items were included here]
   D. _____
   E. _____

   F. This information is important to me (please circle one).
      a. strongly agree
      b. agree
      c. neutral
      d. disagree
      e. strongly disagree

3. How long ago did you receive the information in the box? Please circle the approximate time.

   Yesterday 3 4 5 6 7 days ago

4. By what method did you receive the information listed above? Check all appropriate methods.

   a. Written Memo _____ d. Telephone _____
   b. Electronic Mail _____ c. Talking with a peer _____
   c. Immediate Supervisor _____ e. Overheard someone _____

Thank you for your cooperation. Your responses will remain confidential. Return the questionnaire to the designated location in your area.